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A CASE STUDY

Physiological basis of breastfeeding

POOJA MAURYA AND LATIKA YADAV

See end of the paper for authors' affiliation

Correspondence to :
POOJA MAURYA
Department of Foods and Nutrition, College of Home Science, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA
Email: poojamaurya88@gmail.com

ABSTRACT : A woman's breasts start getting ready to make milk when she becomes pregnant. Breast changes are caused by four main hormones. These hormones cause the ducts and glandular tissue (alveoli) to grow and increase in size (see the anatomy of breastfeeding in the image to the left). Your breasts start to make the first milk, colostrum, in the second trimester. Colostrum is thick and clear to yellow in colour. Once your baby and the placenta are delivered, your body starts to make more milk. Over the next few days, the amount of milk your breasts make will increase and the colour will change to appear more watery and white. Under nutrition is estimated to cause 3.1 million child deaths annually or 45 per cent of all child deaths. Breast feeding is a key area to improve child survival and promote healthy growth and development. The first 2 years of a child's life are particularly important, as optimal nutrition during this period lowers morbidity and mortality, reduces the risk of chronic disease, and fosters better development overall. Optimal breastfeeding is so critical that it could save about 800 000 under 5 child lives every year. Breastfeeding confers short term and longterm benefits on both child and mother, including helping to protect children against a variety of acute and chronic disorders.

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Breastfeeding always has been the criterion standard for infant feeding. Prior to the advent of commercial formulas, breastfeeding was, in truth, the only way to feed an infant. The 20th century brought with it a dramatic change in the way an infant could be fed; for the first time in the evolution of man, non-human milk formulas were created and mass produced in such a way that allowed infants to survive and reach adulthood.

In the 21st century, despite marked improvements in the composition of such formulas, breastfeeding remains the superior form of infant nutriture and also serves as an extrauterine directive of immune development (Goldman, 2007). The issues relevant for lactation success have changed as the world has changed. The ability to counsel breastfeeding women and a multiprong approach significantly impact her success, particularly in urban, low-income women (Iellamo *et al.*, 2015; Dereddy *et al.*, 2015; Rozga *et al.*, 2015; Srinivas *et al.*, 2015).

A Cochrane Database review of 52 studies of 56,451 mother-infant pairs supports this claim. Results of the review show that all forms of extra support showed an increase in the length of time women

continued to breastfeed and the length of time women breastfed without introducing any other types of liquids or foods. Both professional and lay supporters had a positive impact on breastfeeding outcomes. Face-to-face support was significantly more effective compared with telephone support (Renfrew *et al.,* 2012). Separately, in February 2015, results of an online survey of 12 World Health Organization Western Pacific offices revealed that the most commonly reported reason women did not breastfeed was return to work (44%) (Dereddy *et al*., 2015).

A woman's breasts start getting ready to make milk when she becomes pregnant. Breast changes are caused by four main hormones. These hormones cause the ducts and glandular tissue (alveoli) to grow and increase in size (see the anatomy of breastfeeding in the image to the left). Your breasts start to make the first milk, colostrum, in the second trimester. Colostrum is thick and clear to yellow in colour. Once your baby and the placenta are delivered, your body starts to make more milk. Over the next few days, the amount of milk your breasts make will increase and the colour will change to appear more watery and white. Breast milk is thought to be the best form of nutrition for neonates and infants. The properties of human milk facilitate the transition of life from in utero to ex utero. This dynamic fluid provides a diverse array of bioactive substances to the developing infant during critical periods of brain, immune and gut development.

Breast-milk composition :

Breast milk contains all the nutrients that an infant needs in the first 6 months of life, including fat, carbohydrates, proteins, vitamins, minerals and water (WHO, 1989; Lawrence and Lawrence, 2005; Schanler, 2001; Riordan, 2004). It is easily digested and efficiently used. Breast milk also contains bioactive factors that augment the infant's immature immune system, providing protection against infection and other factors that help digestion and absorption of nutrients.

Fats :

Breast milk contains about 3.5 g of fat per 100 ml of milk, which provides about one half of the energy content of the milk. The fat is secreted in small droplets, and the amount increases as the feed progresses. As a result, the *hindmilk* secreted towards the end of a feed is rich in fat and looks creamy white, while the *foremilk* at the beginning of a feed contains less fat and looks somewhat bluish-grey in colour. Breast-milk fat contains long chain polyunsaturated fatty acids (docosahexaenoic acid or DHA and arachidonic acid or ARA) that are not available in other milks. These fatty acids are important for the neurological development of a child.

Carbohydrates :

The main carbohydrate is the special milk sugar lactose, a disaccharide. Breast milk contains about 7 g lactose per 100 ml, which is more than in most other milks and is another important source of energy. Another kind of carbohydrate present in breast milk is oligosaccharides, or sugar chains, which provide important protection against infection (Riordan, 2004).

Protein :

Breast milk protein differs in both quantity and quality from animal milks, and it contains a balance of amino acids which makes it much more suitable for a baby. The concentration of protein in breast milk (0.9 g per 100 ml) is lower than in animal milks. The much higher protein in animal milks can overload the infant's immature kidneys with waste nitrogen products. Breast milk contains less of the protein casein and this casein in breast milk has a different molecular structure. It forms much softer, more easily-digested curds than that in other milks. Among the whey, or soluble proteins, human milk contains more alpha-lactalbumin; cow milk contains beta-lactoglobulin, which is absent from human milk and to which infants can become intolerant (Riordan, 2004).

Vitamins and minerals :

Breast milk normally contains sufficient vitamins for an infant, unless the mother herself is deficient (Butte *et al.,* 2002). The exception is vitamin D. The infant needs exposure to sunlight to generate endogenous vitamin D – or, if this is not possible, a supplement. The minerals iron and zinc are present in relatively low concentration, but their bioavailability and absorption is high. Provided that maternal iron status is adequate, term infants are born with a store of iron to supply their needs; only infants born with low birth weight may need supplements before 6 months. Delaying clamping of the cord until pulsations have stopped (approximately 3 minutes) has been shown

to improve infants' iron status during the first 6 months of life (Cernadas *et al.,* 2006; Chaparro *et al.,* 2006).

Anti-infective factors :

Breast milk contains many factors that help to protect an infant against infection (Hanson, 2004) including: immunoglobulin, principally secretory immunoglobulin A (sIgA), which coats the intestinal mucosa and prevents bacteria from entering the cells; white blood cells which can kill micro-organisms; whey proteins (lysozyme and lactoferrin) which can kill bacteria, viruses and fungi; oligosacccharides which prevent bacteria from attaching to mucosal surfaces. The protection provided by these factors is uniquely valuable for an infant. First, they protect without causing the effects of inflammation, such as fever, which can be dangerous for a young infant. Second, sIgA contains antibodies formed in the mother's body against the bacteria in her gut and against infections that she has encountered, so they protect against bacteria that are particularly likely to be in the baby's environment.

Other bioactive factors :

Bile-salt stimulated lipase facilitates the complete digestion of fat once the milk has reached the small intestine. Fat in artificial milks is less completely digested (Riordan, 2004).

Epidermal growth factor stimulates maturation of the lining of the infant's intestine, so that it is better able to digest and absorb nutrients and is less easily infected or sensitised to foreign proteins. It has been suggested that other growth factors present in human milk target the development and maturation of nerves and retina (Innis,2007).

Colostrum and mature milk :

Colostrum is the special milk that is secreted in the first 2–3 days after delivery. It is produced in small amounts, about 40–50 ml on the first day, but is all that an infant normally needs at this time. Colostrum is rich in white cells and antibodies, especially sIgA and it contains a larger percentage of protein, minerals and fat-soluble vitamins (A, E and K) than later milk (Lawrence and Lawrence, 2005). Vitamin A is important for protection of the eye and for the integrity of epithelial surfaces and often makes the colostrum yellowish in colour. Colostrum provides important immune protection to an infant when he or she is first exposed to the micro-organisms in the environment and epidermal growth factor helps to prepare the lining of the gut to receive the nutrients in milk. It is important that infants receive colostrum and not other feeds, at this time. Other feeds given before breastfeeding is established are called *prelacteal feeds*. Milk starts to be produced in larger amounts between 2 and 4 days after delivery, making the breasts feel full; the milk is then said to have "come in". On the third day, an infant is normally taking about 300–400 ml per 24 hours and on the fifth day 500–800 ml. From day 7 to 14, the milk is called *transitional* and after 2 weeks it is called *mature milk.*

Animal milks and infant formula :

Animal milks are very different from breast milk in both the quantities of the various nutrients and in their quality. For infants under 6 months of age, animal milks can be home-modified by the addition of water, sugar and micronutrients to make them usable as short-term replacements for breast milk in exceptionally difficult situations, but they can never be equivalent or have the same anti-infective properties as breast milk (WHO, 2006). After 6 months, infants can receive boiled full cream milk (WHO, 2005).

Infant formula is usually made from industrially-modified cow milk or soy products. During the manufacturing process the quantities of nutrients are adjusted to make them more comparable to breast milk. However, the qualitative differences in the fat and protein cannot be altered, and the absence of anti-infective and bio-active factors remain. Powdered infant formula is not a sterile product and may be unsafe in other ways. Life threatening infections in newborns have been traced to contamination with pathogenic bacteria, such as *Enterobacter sakazakii*, found in powdered formula (Forsythe, 2005). Soy formula contains *phyto-oestrogens*, with activity similar to the human hormone oestrogen, which could potentially reduce fertility in boys and bring early puberty in girls.

Anatomy of the breast :

The breast structure (Fig. 1) includes the nipple and areola, mammary tissue, supporting connective tissue and fat, blood and lymphatic vessels and nerves (WHO, 1993

and Edgar, 2005).

The mammary tissue :

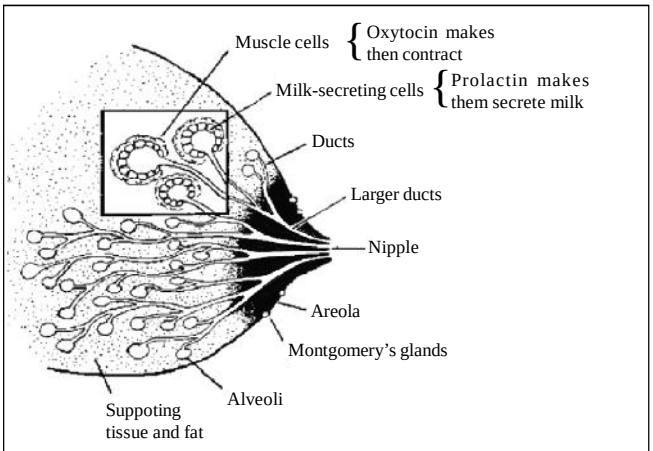

Fig. 1 : Anatomy of breast

This tissue includes the alveoli, which are small sacs made of milk-secreting cells and the ducts that carry the milk to the outside. Between feeds, milk collects in the lumen of the alveoli and ducts. The alveoli are surrounded by a basket of *myoepithelial*, or muscle cells, which contract and make the milk flow along the ducts.

Nipple and areola :

The nipple has an average of nine milk ducts passing to the outside and also muscle fibres and nerves. The nipple is surrounded by the circular pigmented *areola*, in which are located.

Montgomery's glands :

These glands secrete an oily fluid that protects the skin of the nipple and areola during lactation and produce the mother's individual scent that attracts her baby to the breast. The ducts beneath the areola fill with milk and become wider during a feed, when the oxytocin reflex is active.

Hormonal control of milk production :

There are two hormones that directly affect breastfeeding: *prolactin* and *oxytocin*. A number of other hormones, such as oestrogen, are involved indirectly in lactation (Lawrence and Lawrence, 2005). When a baby suckles at the breast, sensory impulses pass from the nipple to the brain. In response, the anterior lobe of the pituitary gland secretes prolactin and the posterior lobe secretes oxytocin.

Prolactin :

Prolactin is necessary for the secretion of milk by the cells of the alveoli. The level of prolactin in the blood increases markedly during pregnancy and stimulates the growth and development of the mammary tissue, in preparation for the production of milk. However, milk is not secreted then, because progesterone and oestrogen, the hormones of pregnancy, block this action of prolactin. After delivery, levels of progesterone and oestrogen fall rapidly, prolactin is no longer blocked and milk secretion begins.

When a baby suckles, the level of prolactin in the blood increases and stimulates production of milk by the alveoli (Fig. 2). The prolactin level is highest about 30 minutes after the beginning of the feed, so its most important effect is to make milk for the next feed. During the first few weeks, the more a baby suckles and stimulates the nipple, the more prolactin is produced and the more milk is produced. This effect is particularly important at the time when lactation is becoming established. Although prolactin is still necessary for milk production, after a few weeks there is not a close relationship between the amount of prolactin and the amount of milk produced. However, if the mother stops breastfeeding, milk secretion may stop too – then the milk will dry up. More prolactin is produced at night, so breastfeeding at night is especially helpful for keeping up the milk supply. Prolactin seems to make a mother feel relaxed and sleepy, so she usually rests well even if

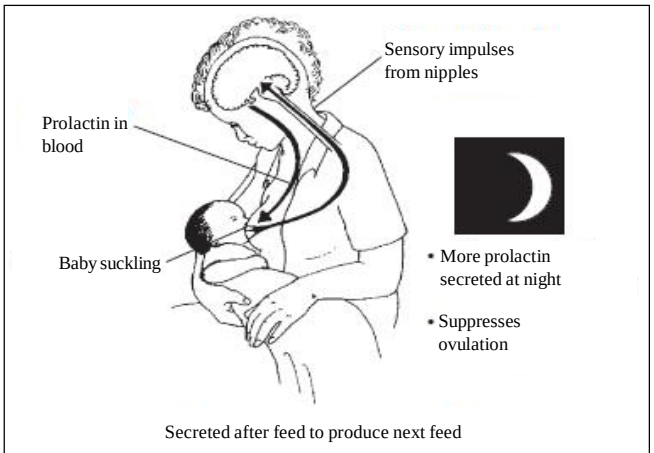

Fig. 2 : Prolactin

she breastfeeds at night.Suckling affects the release of other pituitary hormones, including *gonadotrophin releasing hormone* (GnRH), follicle stimulating hormone, and luteinising hormone, which results in suppression of ovulation and menstruation.

Oxytocin :

Oxytocin makes the myoepithelial cells around the alveoli contract. This makes the milk, which has collected in the alveoli, flow along and fill the ducts (Ramsay *et al.*, 2004). Sometimes the milk is ejected in fine streams.The oxytocin reflex is also sometimes called the "let-down reflex" or the "milk ejection reflex". Oxytocin is produced more quickly than prolactin. It makes the milk that is already in the breast flow for the current feed and helps the baby to get the milk easily. Oxytocin starts working when a mother expects a feed as well as when the baby is suckling. The reflex becomes conditioned to the mother's sensations and feelings, such as touching, smelling or seeing her baby, or hearing her baby cry, or thinking lovingly about him or her. If a mother is in severe pain or emotionally upset, the oxytocin reflex may become inhibited, and her milk may suddenly stop flowing well. If she receives support, is helped to feel comfortable and lets the baby continue to breastfeed, the milk will flow again. Oxytocin makes a mother's uterus contract after delivery and helps to reduce bleeding. The contractions can cause severe uterine pain when a baby suckles during the first few days.

Signs of an active oxytocin reflex :

Mothers may notice signs that show that the oxytocin reflex is active: a tingling sensation in the breast before or during a feed; milk flowing from her breasts when she thinks of the baby or hears him crying; milk flowing from the other breast when the baby is suckling; milk flowing from the breast in streams if suckling is interrupted; slow deep sucks and swallowing by the baby, which show that milk is flowing into his mouth; uterine pain or a flow of blood from the uterus; thirst during a feed.

Psychological effects of oxytocin :

Oxytocin also has important psychological effects, and is known to affect mothering behaviour in animals. In humans, oxytocin induces a state of calm and reduces stress (Uvnas, 1996). It may enhance feelings of affection between mother and child, and promote bonding. Pleasant forms of touch stimulate the secretion of oxytocin and also prolactin and skin-to-skin contact between mother and baby after delivery helps both breastfeeding and emotional bonding (Moore *et al.,* 2007).

Feedback inhibitor of lactation :

Milk production is also controlled in the breast by a substance called the feedback *inhibitor of lactation*, or FIL (a polypeptide), which is present in breast milk (Wilde *et al.*,1995). Sometimes one breast stops making milk while the other breast continues, for example if a baby suckles only on one side. This is because of the local control of milk production independently within each breast. If milk is not removed, the inhibitor collects and stops the cells from secreting any more, helping to protect the breast from the harmful effects of being too full. If breast milk is removed the inhibitor is also removed, and secretion resumes. If the baby cannot suckle, then milk must be removed by expression. FIL enables the amount of milk produced to be determined by how much the baby takes, and therefore by how much the baby needs. This mechanism is particularly important for ongoing close regulation after lactation is established. At this stage, prolactin is needed to enable milk secretion to take place, but it does not control the amount of milk produced.

Reflexes in the baby :

The baby's reflexes are important for appropriate breastfeeding. The main reflexes are *rooting*, *suckling* and *swallowing*. When something touches a baby's lips or cheek, the baby turns to find the stimulus and opens his or her mouth, putting his or her tongue down and forward. This is the *rooting reflex* and is present from about the 32nd week of pregnancy. When something touches a baby's palate, he or she starts to suck it. This is the *sucking reflex*. When the baby's mouth fills with milk, he or she swallows. This is the *swallowing reflex*. Preterm infants can grasp the nipple from about 28 weeks gestational age and they can suckle and remove some milk from about 31 weeks. Co-ordination of suckling, swallowing and breathing appears between 32 and 35 weeks of pregnancy. Infants can only suckle for a short time at that age, but they can take supplementary feeds by cup. A majority of infants can breastfeed fully at a gestational age of 36 weeks (Nyqvist *et al.*,1999).

How a baby attaches and suckles at the breast :

To stimulate the nipple and remove milk from the breast, and to ensure an adequate supply and a good flow of milk, a baby needs to be *well attached* so that he or she can *suckle effectively* (Kent *et al.*,2006). Difficulties often occur because a baby does not take the breast into his or her mouth properly, and so cannot suckle effectively. *Good attachment* The points to notice are: much of the areola and the tissues underneath it, including the larger ducts, are in the baby's mouth; the breast is stretched out to form a long 'teat', but the nipple only forms about one third of the 'teat'; the baby's tongue is forward over the lower gums, beneath the milk ducts (the baby's tongue is in fact cupped around the sides of the 'teat', but a drawing cannot show this); the baby is suckling from the breast, not from the nipple.

As the baby suckles, a wave passes along the tongue from front to back, pressing the teat against the hard palate and pressing milk out of the sinuses into the baby's mouth from where he or she swallows it. The baby uses suction mainly to stretch out the breast tissue and to hold it in his or her mouth. The oxytocin reflex makes the breast milk flow along the ducts and the action of the baby's tongue presses the milk from the ducts into the baby's mouth. When a baby is well attached his mouth and tongue do not rub or traumatise the skin of the nipple and areola. Suckling is comfortable and often pleasurable for the mother. She does not feel pain.

Poor attachment :

The points to notice are: only the nipple is in the baby's mouth, not the underlying breast tissue or ducts; the baby's tongue is back inside his or her mouth and cannot reach the ducts to press on them. Suckling with poor attachment may be uncomfortable or painful for the mother and may damage the skin of the nipple and areola, causing sore nipples and fissures (or "cracks"). Poor attachment is the commonest and most important cause of sore nipples and may result in inefficient removal of milk and apparent low supply.

Effective suckling :

If a baby is well attached at the breast, then he or she can suckle effectively. Signs of effective suckling indicate that milk is flowing into the baby's mouth. The baby takes slow, deep suckles followed by a visible or audible swallow about once per second. Sometimes the baby pauses for a few seconds, allowing the ducts to fill up with milk again. When the baby starts suckling again, he or she may suckle quickly a few times, stimulating milk flow and then the slow deep suckles begin. The baby's cheeks remain rounded during the feed. Towards the end of a feed, suckling usually slows down, with fewer deep suckles and longer pauses between them. This is the time when the volume of milk is less, but as it is fat-rich hindmilk, it is important for the feed to continue. When the baby is satisfied, he or she usually releases the breast spontaneously. The nipple may look stretched out for a second or two, but it quickly returns to its resting form.

Causes of poor attachment :

Use of a feeding bottle before breastfeeding is well established can cause poor attachment, because the mechanism of suckling with a bottle is different. Functional difficulties such as flat and inverted nipples, or a very small or weak infant, are also causes of poor attachment. However, the most important causes are inexperience of the mother and lack of skilled help from the health workers who attend her. Many mothers need skilled help in the early days to ensure that the baby attaches well and can suckle effectively. Health workers need to have the necessary skills to give this help.

Positioning the mother and baby for good attachment:

To be well attached at the breast, a baby and his or her mother need to be appropriately positioned. Whatever the position of the mother, and the baby's general position in relation to her, there are four key points about the position of the baby's body that are important to observe. The baby's body should be straight, not bent or twisted. The baby's head can be slightly extended at the neck, which helps his or her chin to be close in to the breast. He or she should be facing the breast. The nipples usually point slightly downwards, so the baby should not be flat against the mother's chest or abdomen, but turned slightly on his or her back able to see the mother's face. The baby's body should be close to the mother which enables the baby to be close to the breast and to take a large mouthful. His or her whole body should be supported. The baby may be supported on the bed or a pillow, or the mother's lap or arm. She should not support only the

baby's head and neck. She should not grasp the baby's bottom, as this can pull him or her too far out to the side, and make it difficult for the baby to get his or her chin and tongue under the areola.These points about positioning are especially important for young infants during the first two months of life.

Breastfeeding pattern :

To ensure adequate milk production and flow for 6 months of exclusive breastfeeding, a baby needs to feed as often and for as long as he or she wants, both day and night (Kent *et al.*,2006). This is called *demand feeding*, *unrestricted feeding*, or *baby-led feeding*.

Babies feed with different frequencies and take different amounts of milk at each feed. The 24-hour intake of milk varies between mother-infant pairs from 440–1220 ml, averaging about 800 ml per day throughout the first 6 months. Infants who are feeding on demand according to their appetite obtain what they need for satisfactory growth. They do not empty the breast, but remove only 63–72 per cent of available milk. More milk can always be removed, showing that the infant stops feeding because of satiety, not because the breast is empty. However, breasts seem to vary in their capacity for storing milk. Infants of women with low storage capacity may need to feed more often to remove the milk and ensure adequate daily intake and production.

It is thus, important not to restrict the duration or the frequency of feeds – provided the baby is well attached to the breast. Nipple damage is caused by poor attachment and not by prolonged feeds. The mother learns to respond to her baby's cues of hunger and readiness to feed, such as restlessness, rooting (searching) with his mouth, or sucking hands, before the baby starts to cry. The baby should be allowed to continue suckling on the breast until he or she spontaneously releases the nipple. After a short rest, the baby can be offered the other side, which he or she may or may not want.

If a baby stays on the breast for a very long time (more than one half hour for every feed) or if he or she wants to feed very often (more often than every 1–1½ hours each time) then the baby's attachment needs to be checked and improved. Prolonged, frequent feeds can be a sign of ineffective suckling and inefficient transfer of milk to the baby. This is usually due to poor attachment, which may also lead to sore nipples. If the attachment is improved, transfer of milk becomes more efficient and the feeds may become shorter or less frequent. At the same time, the risk of nipple damage is reduced.

Conclusion :

Human milk, in addition to its numerous nutrients that make it an ideal food source for the growing term infant, is a bioactive fluid that evolves from colostrum to mature milk as the infant matures. This bioactive fluid contains numerous factors and live cells that, in concert, promote the growth and well-being of the breastfeeding infant. Oliver Wendell Holmes said it best when he stated, "A pair of substantial mammary glands has the advantage over the two hemispheres of the most learned professor's brain, in the art of compounding a nutritious fluid for infants." With the ever-expanding knowledge resulting from current research, commercial formula clearly cannot replicate all of the valuable properties that are inherent in human milk.

Authors' affiliations :

LATIKA YADAV, Department of Foods and Nutrition, College of Home Science, Maharana Pratap University of Agriculture and Technology, UDAIPUR (RAJASTHAN) INDIA

REFERENCES

Butte, N., Lopez-Alarcon, M.G. and Garza, C. (2002). Nutrient adequacy of exclusive breastfeeding for the term infant during the first six months of life. Geneva, World Health Organization.

Cernadas, J.M.C., Carroli, G. and Lardizábal, J. (2006). Effect of timing of cord clamping on neonatal venous hematocrit values and clinical outcome at term: a randomized, controlled trial: In reply. *Pediatrics*, **118**:1318–1319.

Chaparro, C.M., Neufeld, L.M., Tena Alavez, G., Eguia-Líz Cedillo, R. and Dewey, K.G. (2006). Effect of timing of umbilical cord clamping on iron status in Mexican infants: a randomised controlled trial. *Lancet*, **367**: 1997–2004.

Dereddy, N. R., Talati, A. J., Smith, A., Kudumula, R. and Dhanireddy, R. (2015). A multipronged approach is associated with improved breast milk feeding rates in very low birth weight infants of an inner-city hospital. *J. Human Lactation*, **31**: 43-46.

Edgar, A. (2005). Anatomy of a working breast. *New Beginnings*, **22** : 44-50.

Forsythe, S. (2005). Enterobacter sakasakii and other bacteria in powdered infant milk formula. *Maternal & Child Nutr.,* **1**: 44–50.

Goldman, A.S. (2007). The immune system in human milk and the developing infant. *Breastfeed Med.,* **2**:195-204.

Hanson, L.A. (2004). *Immunobiology of human milk: how breastfeeding protects babies*. Pharmasoft Publishing, Texas, U.S.A.

Iellamo, A., Sobel, H. and Engelhardt, K. (2015). Working mothers of the World Health Organization Western Pacific offices: lessons and experiences to protect, promote and support breastfeeding. *J. Human Lactation*, **31** : 36-39.

Innis, S.M. (2007). Human milk: maternal dietary lipids and infant development. *The Proc. Nutr. Soc.*, **66** : 397–404.

Kent, J., Mitoulas, R., Cregan, D., Ramsay, T. and Dorota, A. (2006). Volume and frequency of breastfeeding and fat content of breastmilk throughout the day. *Pediatrics*, **117**: 387–392.

Lawrence, R.A. and Lawrence, R.M. (2005). *Breastfeeding: a guide for the medical profession*. 6th Ed. Mosby, LONDON, UNITED KINGDOM.

Moore, E.R., Anderson, G.C. and Bergman, N. (2007). Early skin-to-skin contact for mothers and their healthy newborn infants. *Cochrane Datab. System. Rev.*, **2**:CD003519.

Nyqvist, K.H., Sjoden, P.O. and Ewald, U. (1999). The development of preterm infants' breastfeeding behaviour. *Early Human Develop.*, **55** : 247–264.

Ramsay, D.T., Kent J.C., Hartmann, R.A. and Hartmann, P.E. (2004). Ultrasound imaging of milk ejection in the breast of lactating women. *Pediatrics*, **113** : 361–367.

Renfrew, M.J., McCormick, F.M., Wade, A., Quinn, B. and Dowswell, T. (2012). Support for healthy breastfeeding mothers with healthy term babies. *Cochrane Datab. System. Rev.,* **5**:CD001141.

Riordan, J. (2004). The biological specificity of breast milk. In: *Breastfeeding and human lactation*. Jones and Bartlett, Boston, U.S.A,.

Rozga, M.R., Kerver, J.M. and Olson, B.H. (2015). Prioritization of resources for participants in a peer counseling breastfeeding support programme. *J. Human Lactation*, **31**:111-9.

Schanler, R. (2001). Preface. *The Pediatric Clinics of North America*, **48**: 19–20.

Srinivas, G.L., Benson, M., Worley, S. and Schulte, E. (2015). A clinic-based breastfeeding peer counselor intervention in an urban, low-income population: interaction with breastfeeding attitude. *J. Human Lactation*, **31**:120-128.

Uvnas, M. K. (1996). The neuroendocrinology of the mother-child interaction. *Trends in Endocrinol. & Metabolism*, **7**:126–131.

WHO (1989). Infant feeding: the physiological basis. *Bull. World Health Organization*, **67** : 1–107.

WHO (1993). *Breastfeeding counselling: a training course. Trainer's guide* (Session 3: How breastfeeding works) and Overhead figures (Figure 3/1). World Health Organization, (WHO/CDR/93.4 and WHO/CDR/93.6) GENEVA.

WHO (2005). *Guiding principles for feeding non-breastfed children 6–24 months of age*. World Health Organization, GENEVA.

Wilde, C.J., Prentice, A. and Peaker, M. (1995). Breastfeeding: matching supply and demand in human lactation. *Proc. Nutr. Soc.*, **54** : 401–406.

❐WEBLIOGRAPHY:

WHO (2006). *Home-modified animal milk for replacement feeding: is it feasible and safe? Discussion paper prepared for "HIV and infant feeding Technical Consultation"*, Geneva, World Health Organization, 2006 (*http://www.who.int/17 child_adolescent_health/documents/a91064/en/, accessed 5 November 2008).*